EXPRESS MAIL LABEL NO. EV270264150US

PATENTS
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Applicant	:	Steven D. Roach
Application No.	:	10/003,096 Confirmation No. : 5186
Filed	:	December 6, 2003
For	:	CIRCUITRY AND METHODS FOR IMPROVING THE PERFORMANCE OF A LIGHT EMITTING ELEMENT
Group Art Unit	:	2821
Examiner	:	Jimmy Vu

New York, New York 10020
August 23, 2004

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

REPLY TO OFFICE ACTION

Sir:

This is in reply to the Office Action dated April 21, 2004, in the above-identified patent application.

Pursuant to 37 C.F.R. § 1.136(a)(1), applicant hereby petitions for a one-month extension of time for response to the Office Action. With this extension, the due date for reply to

this Office Action is August 23, 2004 (August 21, 2004 is a Saturday).

In response to the Office Action, applicant amends the application as follows:

Amendments to the Claims begin on page 2 of this Reply.

Remarks begin on page 15 of this Reply.

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (Currently amended) A method for providing a light emitting component with a predetermined input impedance comprising:

providing a light emitting element disposed on a substrate;

providing an impedance circuit disposed on the substrate that is coupled to the light emitting element, wherein the light emitting element and the impedance circuit are fabricated on a single substrate;

adjusting an impedance of the impedance circuit so that the equivalent input impedance of the light emitting component is set to the predetermined value.

2. (Original) The method of claim 1 further comprising determining the impedance of the light emitting element.

3. (Original) The method of claim 1 further comprising determining the impedance of the light emitting component.

4. (Original) The method of claim 1 wherein the providing an impedance circuit includes providing an adjustable resistor.

5. (Original) The method of claim 4 wherein the adjusting further comprises adjusting a resistance value of the adjustable resistor.

6. (Original) The method of claim 1 wherein the adjusting further comprises adjusting the input impedance of the light emitting component such that the input impedance is substantially resistive.

7. (Original) The method of claim 1 wherein the providing an impedance circuit includes providing an adjustable inductor.

8. (Not entered)

9. (Previously presented) The method of claim 1 wherein the adjusting further comprises adjusting an inductance value of the adjustable inductor.

10. (Original) The method of claim 1 wherein said providing an impedance circuit includes providing an adjustable capacitor.

11. (Original) The method of claim 10 wherein the adjusting further comprises adjusting a capacitance value of the adjustable capacitor.

12. (Original) The method of claim 1 wherein the adjusting further comprises adjusting the impedance of the impedance circuit to substantially compensate for a reactive impedance associated with the light emitting element so that the equivalent input impedance of the light emitting component is substantially resistive.

13. (Original) The method of claim 1 characterized by the use of a vertical cavity surface emitting laser (VCSEL) as the light emitting element.

14. (Original) The method of claim 12 wherein the adjusting further comprises trimming circuit components in the network.

15. (Currently amended) A method for providing a light emitting component having an input impedance that substantially matches a characteristic impedance of a transmission line comprising:

providing a light emitting element disposed on a substrate;

providing an impedance circuit disposed on the substrate that is coupled to the light emitting element, wherein the light emitting element and the impedance circuit are fabricated on a single substrate;

adjusting an impedance of the impedance circuit so that the input impedance of the light emitting component substantially matches the characteristic impedance of the transmission line.

16. (Currently amended) A method for providing a light emitting component having an input impedance that substantially matches an output impedance of a driver circuit comprising:

providing a light emitting element disposed on a substrate;

providing a variable impedance circuit disposed on the substrate that is coupled to the light emitting element, wherein the light emitting element and the impedance circuit are fabricated on a single substrate;

adjusting an impedance of the impedance circuit so that the input impedance of the light emitting component substantially matches the output impedance of the driver circuit.

17. (Currently amended) A method for obtaining a desired frequency response from a light emitting element disposed on a substrate comprising:

determining the desired frequency response of the light emitting element to an input signal;

providing a network with a variable transfer function coupled to the light emitting element and disposed on the substrate, wherein the light emitting element and the network are fabricated on a single substrate; and

adjusting the transfer function of the network to obtain the desired frequency response from the light emitting element.

18. (Original) The method of claim 17 wherein the transfer function is adjusted to optimize bandwidth of the light emitting element.

19. (Original) The method of claim 17 wherein the transfer function is adjusted to optimize high frequency response of the light emitting element.

20. (Original) The method of claim 17 wherein the providing includes providing an adjustable resistor in the network.

21. (Original) The method of claim 20 wherein the adjusting further comprises adjusting a resistance value of the adjustable resistor.

22. (Original) The method of claim 17 wherein the providing includes providing an adjustable inductor in the network.

23. (Original) The method of claim 22 wherein the adjusting further comprises adjusting an inductance value of the adjustable inductor.

24. (Original) The method of claim 17 wherein the providing includes providing an adjustable capacitor in the network.

25. (Original) The method of claim 24 wherein the adjusting further comprises adjusting a capacitance value of the adjustable capacitor.

26. (Original) The method of claim 17 wherein the adjusting further comprises trimming circuit components in the network.

27. (Currently amended) A light emitting component comprising:

a light emitting element disposed on a substrate for emitting light; and

an adjustable impedance network disposed on the substrate and coupled to the light emitting circuit for adjusting the impedance of said light emitting component to a

desired value, wherein the light emitting element and the impedance network are fabricated on a single substrate.

28. (Original) The light emitting component of claim 27 wherein the light emitting element is a vertical cavity surface emitting laser (VCSEL).

29. (Original) The light emitting component of claim 27 wherein the impedance network includes a resistor.

30. (Original) The light emitting component of claim 29 wherein the resistor is adjustable.

31. (Original) The light emitting component of claim 27 wherein the impedance network includes a capacitor.

32. (Original) The light emitting component of claim 31 wherein the capacitor is adjustable.

33. (Original) The light emitting component of claim 27 wherein the impedance network includes an inductor.

34. (Original) The light emitting component of claim 33 wherein the inductor is adjustable.

35. (Original) The circuit defined in claim 27 wherein the impedance network is formed, at least in part, from metal disposed on the surface of the substrate.

36. (Original) The light emitting component of claim 27 wherein the impedance network is adjustable by an end-item user.

37. (Original) The light emitting component of claim 27 wherein the impedance network is adjustable at the wafer level.

38. (Original) The light emitting component of claim 27 wherein the impedance network is adjustable at the optical subassembly level.

39. (Original) The light emitting component of claim 27 wherein the impedance network is adjustable at the module level.

40. (Previously presented) A light emitting component comprising:

a light emitting element disposed on a substrate for emitting light;

an impedance network disposed on the substrate and coupled to the light emitting circuit; and

circuitry for establishing a current threshold of the light emitting component.

41. (Previously presented) A light emitting component comprising:

a light emitting element disposed on a substrate for emitting light;

an impedance network disposed on the substrate and coupled to the light emitting circuit; and

circuitry for adjusting a current threshold of the light emitting component.

42. (Previously presented) A light emitting component comprising:

a light emitting element disposed on a substrate for emitting light;

an impedance network disposed on the substrate and coupled to the light emitting circuit; and

circuitry for adjusting a slope efficiency of the light emitting component.

43. (Currently amended) A light emitting component comprising:

a light emitting element disposed on a substrate for emitting light;

an impedance network disposed on the substrate and coupled to the light emitting circuit; and

circuitry for establishing a slope efficiency of the light emitting component.

44. (Currently amended) A method for obtaining a desired response from a light emitting element disposed on a substrate comprising:

determining the desired response of the light emitting element to an input signal;

providing a network with a variable transfer function coupled to the light emitting element and disposed on the substrate, wherein the light emitting element and the network are fabricated on a single substrate; and

adjusting the transfer function of the network to obtain the desired response from the light emitting element.

45. (Original) A method of claim 44 wherein the desired response is a desired time domain response, and wherein

the adjusting further comprises adjusting the transfer function of the network to obtain the desired time domain response.

46. (Original) A method of claim 44 wherein the desired response is a predetermined settling time, and wherein the adjusting further comprises adjusting the transfer function of the network to obtain the predetermined settling time.

47. (Original) A method of claim 44 wherein the desired response is extended bandwidth, and wherein the adjusting further comprises adjusting the transfer function of the network to obtain the desired extended bandwidth.

48. (Currently amended) A method for providing a light emitting component having an input impedance within a predetermined range comprising:

selecting a range of impedance values;

providing a light emitting element disposed on a substrate; and

providing an impedance circuit disposed on the substrate and coupled to the light emitting element so that the input impedance of the light emitting component is within the

selected range, wherein the light emitting element and the impedance circuit are fabricated on a single substrate.

REMARKS

I. Summary of the Office Action

Claims 1-7 and 9-48 are pending in this application.

Claims 1-7, 9-35, and 40-48 were rejected under 35 U.S.C. § 102(b) as being anticipated by Lim U.S. Patent No. 6,026,108 (hereinafter "Lim").

Claims 36-39 were rejected under 35 U.S.C. § 103(a) as being obvious from Lim in view of Official Notice.

II. Summary of Applicant's Reply

Applicant has amended claims 1, 15-17, 27, 44, and 48 to more particularly define the invention. No new matter has been introduced as a result of these amendments.

Applicant is submitting a Fourth Supplemental Information Disclosure Statement concurrently herewith.

The Examiner's rejections are respectfully traversed.

III. The § 102 Rejection

Claims 1-7, 9-35, and 40-48 were rejected under 35 U.S.C. § 102(b) as being anticipated by Lim. The Examiner's rejection is respectfully traversed.

In general, applicant's invention is directed towards a light emitting component, in which a light emitting element

is coupled to an impedance circuit or network with a variable transfer function. Independent claims 1, 15-17, 27, 43, and 48 have been amended to specify that the light emitting element and the impedance circuit (or network) are fabricated on a single substrate, as opposed to only being disposed on the same substrate.

Lim relates to a vertical-cavity surface-emitting laser (VCSEL). In particular, Lim discusses inducing self-pulsation through a wavelength dependent intracavity quantum-well absorber. For example, Lim shows a circuit for causing the self-pulsation in a VCSEL in FIG. 20.

Applicant submits that Lim does not show or suggest fabricating a light emitting element and an impedance matching circuit on a single integrated circuit, as required by amended independent claims 1, 15-17, 27, 43, and 48. In particular, applicant submits that the circuit identified by the Examiner in FIG. 20 of Lim is external to the VCSEL. As shown in FIG. 20 (and also FIG. 31A), the VCSEL is depicted as a discrete component (i.e., surrounded by a box), which indicates that the VCSEL is a separate component from the circuit. This is supported by Lim, in which the circuitry in FIG. 20 is referred to as "external circuitry" (Lim, column 3, line 45).

Accordingly, Lim shows impedance circuitry that may be coupled to the VCSEL, but is external to the VCSEL. Therefore, Lim does not show or suggest fabricating a light emitting element and an impedance circuit on a single integrated circuit.

Fabricating a light emitting element and an impedance matching circuit on a single integrated circuit leads to numerous advantages. For example, the impedance of the impedance matching circuit may be adjusted once, for example, prior to packaging. Thus, the characteristic impedances of the light emitting components may be conformed without the need for compensation circuitry.

Furthermore, circuit 174 of Lim includes a variable resistor, an inductor and a capacitor. The variable resistor is the only component whose impedance may be adjusted. (The capacitor and inductor are part of a bias-T circuit for blocking DC and AC currents, respectively, and therefore, they do not require adjustment (see Lim, column 12, lines 25-30).) Therefore, Lim does not show adjusting the inductance and capacitance of the impedance circuit as required by dependent claims 7, 9-11, 22-25, 32, and 34.

Furthermore, as stated above, circuit 174 is external to VCSEL 130 (i.e., not fabricated on the same integrated

circuit). As such, the resistance of the variable resistor is adjusted manually. Therefore, Lim does not show or suggest adjusting the impedance of impedance circuitry by trimming circuit components, as required by dependent claims 14 and 26.

For at least the above reasons, Lim does not show or suggest fabricating a light emitting element and an impedance circuit (or network) on a single integrated circuit, as required by independent claims 1, 15-17, 27, 44, and 48, as amended. Furthermore, Lim does not show or suggest the features of dependent claims 7, 9-11, 14, 22-26, 32, and 34. The remaining rejected dependent claims, claims 2-6, 12, 13, 18-21, 28-31, 32, 33, 35, and 45-47, are allowable at least for being dependent from allowable independent claims (i.e., claims 1, 27, and 44). Accordingly, the Examiner's rejection should be withdrawn.

III. The § 103 Rejection

Claims 36-39* were rejected under 35 U.S.C. § 103(a) as being obvious from Lim in view of Official Notice. Claims 36-39 depend from claim 27, which has been shown above to be allowable. Accordingly, the Examiner's rejection should be withdrawn.

If the Examiner maintains this obviousness rejection based on Official Notice, then applicant respectfully requests that the Examiner provide a reference which shows adjusting an impedance network by the end-item user, at the wafer level, at the optical subassembly level, and at the module level, as is applicant's right under MPEP §§ 2144-2144.03. "[A]ssertions of technical facts in areas of esoteric technology must always be supported by citation of some reference work" (MPEP § 2144.03, citing In re Ahlert, 424 F.2d 1088, 1091, 165 USPQ 418, 420 (CCPA 1970)).

* Applicant assumes that the Examiner rejected claims 36-39, instead of claims 35-38 because the Examiner refers to the subject matter of claims 36-39 in the Office Action.

IV. Conclusion

In view of the foregoing, claims 1-7 and 9-48 are allowable. This application is therefore in condition for allowance. Reconsideration and allowance of this application are respectfully requested.

Respectfully submitted,

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